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1. INTRODUCTION

This Attachment was prepared in support of Excelsior Mining Arizona, Inc.'s (Excelsior's) Underground Injection Control (UIC) Permit application to the United States Environmental Protection Agency (USEPA). Excelsior is applying for an area Class III UIC permit to install a wellfield for in-situ recovery (ISR) of copper at the Gunnison Copper Project (Project), located in Cochise County, Arizona.

1.1 Regulatory Requirements and Applicability

The plugging and abandonment plan is applicable to proposed Class III injection wells. Wells used for fluid injection are required to be abandoned under Chapter 40 of the Code of Federal Regulations (CFR) 146.10. The statute requires that the wells or boreholes are abandoned in such a way that fluid will not move into underground sources of drinking water (USDWs). In addition to the federal requirements, Arizona Administrative Code (A.A.C.) R12-15-816 contains abandonment requirements and additional guidance is provided in the Arizona Department of Water Resources Well Abandonment Handbook (AWDR, 2008) attached as Attachment Q-2. The handbook states that the abandonment of a well be accomplished "through filling or sealing the well so as to prevent the well, including the annular outside casing, from being a channel allowing the vertical movement of water."

1.2 Protection of Underground Sources of Drinking Water

An aquifer exemption for the oxide zone within the bounds of the Area of Review (AOR) is provided as Attachment S. The proposed aquifer exemption includes the following units within the AOR:

- Saturated Basin Fill (basin fill below an elevation of 4185 feet),
- Bedrock in the oxide zone (zone of injection),
- The top 200 feet of the sulfide zone,
- Tertiary quartz monzonite down to an elevation of 3100 feet above mean sea level (as shown on Figure D-5).

~~The basin fill within the AOR that overlies the bedrock and the sulfide zone that is beneath the oxide zone in bedrock are not USDWs, as discussed in Attachment S.~~ The following elements of the wellfield operation, design, and abandonment are protective of USDWs:

- ~~There is no USDW within the AOR.~~
- Hydraulic control wells will operate during ISR operations to prevent excursions into USDWs outside of the AOR.
- After ISR is complete in a given block of the wellfield, the block will be rinsed to restore groundwater quality. Hydraulic control will be maintained until aquifer groundwater quality standards are achieved.
- Injection, recovery, observation, and hydraulic control wells located within the AOR will be constructed according to Class III requirements (as discussed in Attachments L and M) and plugged and abandoned according to procedures in this attachment.

2. LICENSURE AND PERMITTING

2.1 Licensed Drillers

Plugging and abandonment must be conducted by a licensed well driller pursuant to A.A.C R12-15-816A. Well Drillers are licensed by Arizona Department of Water Resources (ADWR) pursuant to Arizona Revised Statute (A.R.S.) R45-595B. Excelsior will contract with a driller that meets these specifications for all plugging and abandonment conducted under this plan.

2.2 Abandonment Notification and Authorization

Examples of Plugging and Abandonment Plan (USEPA Form 7520-14) form are included for a typical injection/recovery well, a hydraulic control well, and an observation well, as described in Attachment K. The example forms are included in Attachment Q-2. Prior to the abandonment of each well, Excelsior will submit a Notice of Intent to Abandon a Well (ADWR Form 55-28). A blank Form 55-28 is included as in Attachment Q-2. Plugging and abandonment at each site will not start until authorization for the abandonment is issued to the drilling contractor by ADWR and to Excelsior by USEPA.

3. WELL AND BOREHOLE ABANDONMENT PROCEDURES

3.1 General Procedure for Plugging and Abandonment

Plugging and abandonment will be conducted based on the "Standard Abandonment Method" in the ADWR Well Abandonment Handbook (Attachment Q-2). Refer to figures Q-2-1 through Q-2-5 for abandonment illustrations.

3.1.1 Well and Borehole Preparation

The following tasks will be completed prior to well and borehole abandonment to ensure the success of the plugging procedures that are proposed in the next sub-section.

1. Inspect and Document Well : The well will be inspected from the surface. The condition will be documented and recorded and the site will be photographed.
2. Remove Equipment: Equipment including pumps, wiring, tubing, and transducers will be removed from the well. Any equipment that cannot be retrieved will be documented.
3. Casing~~/Screen~~: Annular spaces outside of the solid casing of ~~I~~injection and recovery wells will be grouted to 100 feet above the bedrock contact or groundwater surface, whichever is shallower, when the well is constructed. Therefore, ~~N~~no perforation of the casing will be required for abandonment due to this design.

~~3.~~4. Screened interval: If the well is constructed using steel slotted well screen, the screened interval will be perforated prior to cementing the well.

3.1.2 Plugging Procedure

Each well or borehole will be filled as completely as possible with Type V neat cement using the following procedure.

1. The area around the well will be cleared and the casing will be cut at two or more feet below grade. Cement or steel resulting from cutting casing will be removed from the site.
2. Tremie pipe will be installed to within 20 feet of the bottom of the well. For wells that are determined to be obstructed during preparation, the contractor will try to push the tremie pipe through the obstruction. If the tremie cannot be installed through the obstruction, the contractor will try to install drill pipe through the obstruction. If both of those options fail, the well will be abandoned from the obstruction to the surface.
3. Type V cement will be installed through the tremie pipe with the end of the tremie pipe below the top surface of the cement to ensure that there are no gaps in the cement seal.

The cement will be installed under enough pressure to fill voids in the borehole wall and casing.

4. The site will be levelled and the abandoned well will be covered with soil.

4. DOCUMENTATION AND REPORTING

4.1 Documentation

Field personnel will record types and quantities of materials used and emplacement depths of each material. Each site will be photographed after completion and covering of the borehole. Copies of field data and the forms described below will be maintained at the Project site for inspection until closure is completed.

4.2 Reporting

Following the plugging and abandonment of existing or injection wells, reports will be filed with state and federal agencies as described below.

ADWR: Within 30 days of the completion of plugging and abandonment the drilling contractor will submit a Well Abandonment Completion Report (Form 55-58) to ADWR. Within 30 days of completion of plugging and abandonment Excelsior or their designee will submit a Well Owner's Notification of Abandonment (Form 55-36). The forms are included as Exhibit B.

USEPA: Excelsior will report plugging and abandonment activities in the quarterly monitoring reports sent to the USEPA Director. The plugging and abandonment will be included in the quarterly report for the quarter in which the activities were completed. Reporting data will include an updated version of Form 7520-14 and copies of the forms sent to ADWR described above.

ADEQ: will also be notified, as plugging and abandonment is an element of "Best Available Demonstrated Control Technology" (BADCT) for the wellfield.